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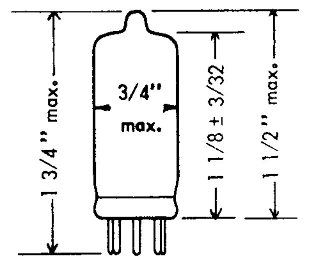
TECHNICAL INFORMATION

MINIATURE PENTODE

TYPE CK6187

Excellence in Electronics

The CK6187 is a miniature sharp cut off pentode designed for applications in RF amplifiers. This type features a control grid and suppressor grid which can be used as independent control elements. It is also suitable for use in delay circuits, gated amplifiers, gain controlled amplifiers and mixer circuits.



MECHANICAL DATA

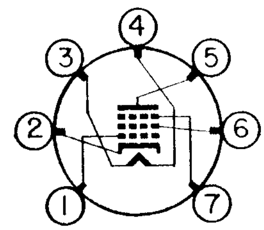
ENVELOPE: T–5 1/2 (6–1)
BASE: Miniature Button 7 Pin, E7–1
TERMINAL CONNECTIONS:

Pin 1 Grid #1	Pin 5 Plate
Pin 2 Cathode, Internal Shield	Pin 6 Grid #2
Pin 3 Heater	Pin 7 Grid #3
Pin 4 Heater	

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock Test– Note 2)	450 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test – Note 3)	2.5 G
Maximum Bulb Temperature	+165 °C

MOUNTING POSITION: Any



ELECTRICAL DATA

CAUTION–––To Electronic Equipment Design Engineers: Special attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

RATINGS AND NORMAL OPERATION:	MIL-E-1 SYMBOL	ABSOLUTE MINIMUM	NORMAL TEST CONDITIONS (Note 5)	NORMAL OPERATION (Note 4)	ABSOLUTE MAXIMUM	MIL-E-1 UNITS
Heater Voltage (Note 6)	Ef:	5.7	6.3	6.3	6.9	V
Plate Voltage	Eb:	----	120	120	200	Vdc
Grid Voltage	Ec1:	–55.0	–2.0	–2.0	0	Vdc
Grid #2 Voltage	Ec2:	----	120	120	155	Vdc
Grid #3 Voltage	Ec3:	–55	0	0	30	Vdc
Heater Cathode Voltage	Ehk:	----	0	0	100	V
Plate Dissipation:	Pp	----	----	0.624	1.65	Watts
Grid #2 Dissipation	Pg2:	----	----	0.42	0.55	Watts
Grid Resistance	Rg	----	----	----	0.1	Meg.
Transconductance	Gm:	----	----	3200	----	µmhos
Grid Current	Ic1:	----	----	----	1.0	mAdc
Plate Current	Ib1:	----	----	5.2	----	mAdc
Grid #2 Current	Ic2:	----	----	3.5	----	mAdc
Grid #3 Current	Ic3:	----	----	----	0.2	mAdc
Cathode Current	Ik:	----	----	8.7	20	mAdc

Tentative Data

ELECTRICAL DATA (Cont'd)

CHARACTERISTICS AND QUALITY CONTROL (Note 1)

In the following tests each unit is tested separately

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS, PART 1		**Combined AQL=1.0% excluding Mechanical and Inoperatives**								
Heater Current:		0.65	If:	160	168	175	182	190	14	mA
Heater Cathode Leakage:	Ehk=+100	0.65	Ihk:	----	----	----	----	10	----	μAdc
	Ehk=−100		Ihk:	----	----	----	----	10	----	μAdc
Grid Current (1):	Rg=0.1 Meg.	0.65	Ic1:	0	----	----	----	−0.1	----	μAdc
Plate Current (1):		0.65	Ib1:	2.5	4.2	5.2	6.2	9.0	2.3	mAdc
Transconductance (1):		0.65	Sm(1):	2500	2900	3200	3500	4500	750	μmhos
Continuity and Shorts: (Inoperatives)		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope T-5½ (6-1)	----	----	----	----	----	----	----	----	----
MEASUREMENTS ACCEPTANCE TESTS, PART 2										
Insulation of Electrodes:	g1-all=−100 Vdc	2.5	Rg1-all:	100	----	----	----	----	----	Meg.
	g3-all=−100 Vdc		Rp-all:	100	----	----	----	----	----	Meg.
	p-all=−300 Vdc		Rg3-all:	100	----	----	----	----	----	Meg.
Plate Current (2):	Ec1=−3 Vdc; Ec3=−10 Vdc	2.5	Ib(2):	----	----	----	----	200	----	μAdc
Screen Current		2.5	Ic(2):	1.5	----	----	----	5.5	----	mAdc
Plate Current (3):	Ec1=−3 Vdc; Ec3=−6 Vdc	2.5	Ib(3):	5.0	----	----	----	----	----	μAdc
Plate Current (4):	Ec1=−8 Vdc	2.5	Ib(4):	----	----	----	----	200	----	μAdc
Plate Current (5):	Ec1=−6 Vdc	2.5	Ib(5):	5.0	----	----	----	----	----	μAdc
Transconductance (2):	Ef=5.7 V (Note 7)	2.5	Δ_{Ef}Sm(2):	----	----	----	----	15	----	%
Grid Emission:	Ef=7.5 V; Rg=0.1 meg; Ec1=−10 Vdc; Preheat 5 min. at Ef=7.5 V; Rk=130 ohms; Eb=180 Vdc; Ec2=125 Vdc; Rg1=0.1 meg.	2.5	ISc:	----	----	----	----	−1.0	----	μAdc
RF Noise:	Ec1=0; Ecal=15.0 mVac; Rk=200 ohms; Ck=0.2 mfd (Note 9)	2.5	----	----	----	----	----	----	----	----
Noise and Microphonics:	Ef=6.3 Vac; Ebb=Ecc2=200 Vdc; Ec1=0; Ecal=175 mVac; Rk=1000 ohms; Rp=0.1 meg.; Rg2=.5 meg; Cg2=2 μfd; Ck=1000 μfd min. (Note 10)	2.5	----	----	----	----	----	----	----	----
Transconductance (3):	Ec1=−3 Vdc	6.5	S(g3-p):	350	----	----	----	1050	----	μmhos
Transconductance (4):	Ec3=−5 Vdc	6.5	S(g1-p):	700	----	----	----	1700	----	μmhos
Capacitance:	Shield #316	6.5	Cg-p:	----	----	----	----	.02	----	μμf
Capacitance:	Shield #316		Cin:	3.5	----	----	----	4.5	----	μμf
Capacitance:	Shield #316		Cout:	2.6	----	----	----	3.4	----	μμf
Low Pressure Voltage Breakdown:	Pressure=55±5 mmHg; Voltage=500 Vac	6.5	----	----	----	----	----	----	----	----
Vibration (2):	F=25 cps; G=2.5 Rp=10,000 ohms	6.5	Ep:	----	----	----	----	150	----	mVac

ELECTRICAL DATA (Cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (Cont'd)

In the following tests each unit is tested separately

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN.	MAX.	MIL-E-1 UNITS	Allowable Defects per Characteristics 1 st Sample	Combined Sample
DEGRADATION RATE ACCEPTANCE TESTS								
Shock:	Hammer angle= 30°; Ehk=+ 100 Vdc; heater positive; Rg= 0.1 meg.	20	----	----	----	----	----	----
Fatigue:	96 hours; G= 2.5; fixed frequency; F= 25 min., 60 max.	6.5	----	----	----	----	----	----
Post Shock and Fatigue Test End Points:								
Vibration (2):	F= 25 cps; G= 2.5; Rp= 10 Kohms	----	Ep:	----	300	mVac	----	----
Heater Cathode Leakage:	Ehk=+ 100 Vdc	----	Ihk:	----	30	µAdc	----	----
	Ehk= -100 Vdc	----	Ihk:	----	30	µAdc	----	----
Transconductance (1):		----	Sm:	2200	----	µmhos	----	----
Grid Current (1):		----	Ic:	0	-0.4	µAdc	----	----
Glass Strain (Thermal Shock):		2.5	----	----	----	----	----	----
Miniature Tube Base Strain:		----	----	----	----	----	----	----
ACCEPTANCE LIFE TESTS								
Heater Cycling Life Test:	Ef= 7.5 V; Ehk=+ 135 Vdc Ec1= Ec2= Ec3= Eb= 0 1 min, on, 1 min. off	1.0	----	2000	----	cycles	----	----
Heater Cycling Life Test End Points:								
Heater Cathode Leakage:	Ehk=+ 100 Vdc	----	Ihk:	----	20	µAdc	----	----
	Ehk= -100 Vdc	----	Ihk:	----	20	µAdc	----	----
1 Hour Stability Life Test:	Eb= 180 Vdc; Ec1= 0; Ec2= 125 Vdc; Ehk= + 135 Vdc; Rk= 130 ohms; Rg1= 0.1 meg.; TA= Room	----	----	----	----	----	----	----
1 Hour Stability Life Test End Points:	(Typical Sample Size= 50 tubes)							
Transconductance (1) Change of individual tube from initial:		1.0	Δ_t Sm:	----	10	%	----	----
100 Hour Survival Rate Life Test:	Eb= 180 Vdc; Ec1= 0; Ec2= 125 Vdc; Ehk=+ 135 Vdc; Rk= 130 ohms; Rg1= 0.1 meg.; TA= Room	----	----	----	----	----	----	----
100 Hour Survival Rate Life Test End Points:	(Typical Sample Size= 200 tubes)							
Shorts and Continuity: (Inoperatives)		0.65	----	----	----	----	----	----
Transconductance (1):		1.0	Sm:	2200	----	µmhos	----	----
500 and 1000 hours Intermittent High Temperature Life Test:	Eb= 180 Vdc; Ec1= 0; Ec2= 125 Vdc; Ehk=+ 135 Vdc; Rk= 130 ohms; Rg1= 0.1 meg.; T Envelope= + 165 °C min.	----	----	----	----	----	----	----

ELECTRICAL DATA (Cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

In the following tests each unit is tested separately.

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
ACCEPTANCE LIFE TESTS (Cont'd)								
500 Hour Intermittent High Temperature Life Test End Points:	(Typical sample size= 20 tubes 1st sample, 40 tubes 2nd sample)	----	----	----	----	----	----	----
Inoperatives:		----	----	----	----	----	1	3
Grid Current (1):		----	Ic1:	0	−0.1	μAdc	1	3
Heater Current:		----	If:	160	190	mA	1	3
Change in Transconductance (1) of Individual Tubes:		----	Δ_t Sm:	----	20	%	1	3
Heater Cathode Leakage:	Ehk=+100 Vdc	----	Ihk:	----	10	μAdc	1	3
	Ehk=−100 Vdc	----	Ihk:	----	10	μAdc	1	3
Transconductance (2):		----	Δ_{Ef} Sm:	----	15	%	2	5
Electrode Insulation:								
(p-all)		----	Rp-all:	50	----	Meg.	2	5
(Rg1—all)		----	Rg1—all:	50	----	Meg.		
(g3-all)		----	Rg3-all:	50	----	Meg.		
Transconductance (1) Average Change:		----	Avg. Δ_t Sm:	----	15	%	----	----
Total Defectives:		----	----	----	----	----	4	8
1000 Hour Intermittent High Temperature Life Test End Points:	(Typical sample size= 20 tubes 1st sample, 40 tubes 2nd sample	----	----	----	----	----	----	----
Inoperatives:		----	----	----	----	----	2	5
Grid Current (1):		----	Ic(1):	0	−0.1	μAdc	2	5
Heater Current:		----	If:	160	190	mA	2	5
Change in Transconductance of Individual Tubes:		----	Δ_t Sm:	----	25	%	2	5
Heater Cathode Leakage:	Ehk=+100 Vdc	----	Ihk:	----	10	μAdc	2	5
	Ehk=−100 Vdc	----	Ihk:	----	10	μAdc		
Total Defectives:		----	----	----	----	----	5	10

NOTES:

Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1 "Inspection Instructions for Electron Tubes" and MIL-STD-105A.

Note 2: Test conditions and acceptance criteria per Shock Test Procedures of MIL-E-1 basic specifications.

Note 3: Test conditions and acceptance criteria per Fatigue Test Procedures of MIL-E-1 basic specifications.

Note 4: These normal values represent conditions at which control of reliability may be expected.

Note 5: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.

Note 6: For most applications the performance will not be adversely affected by ± 10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

Note 7: Change of transconductance for individual tubes from that value measured at Ef= 6.3 V to that value measured at Ef= 5.7.

ELECTRICAL DATA (Cont'd)

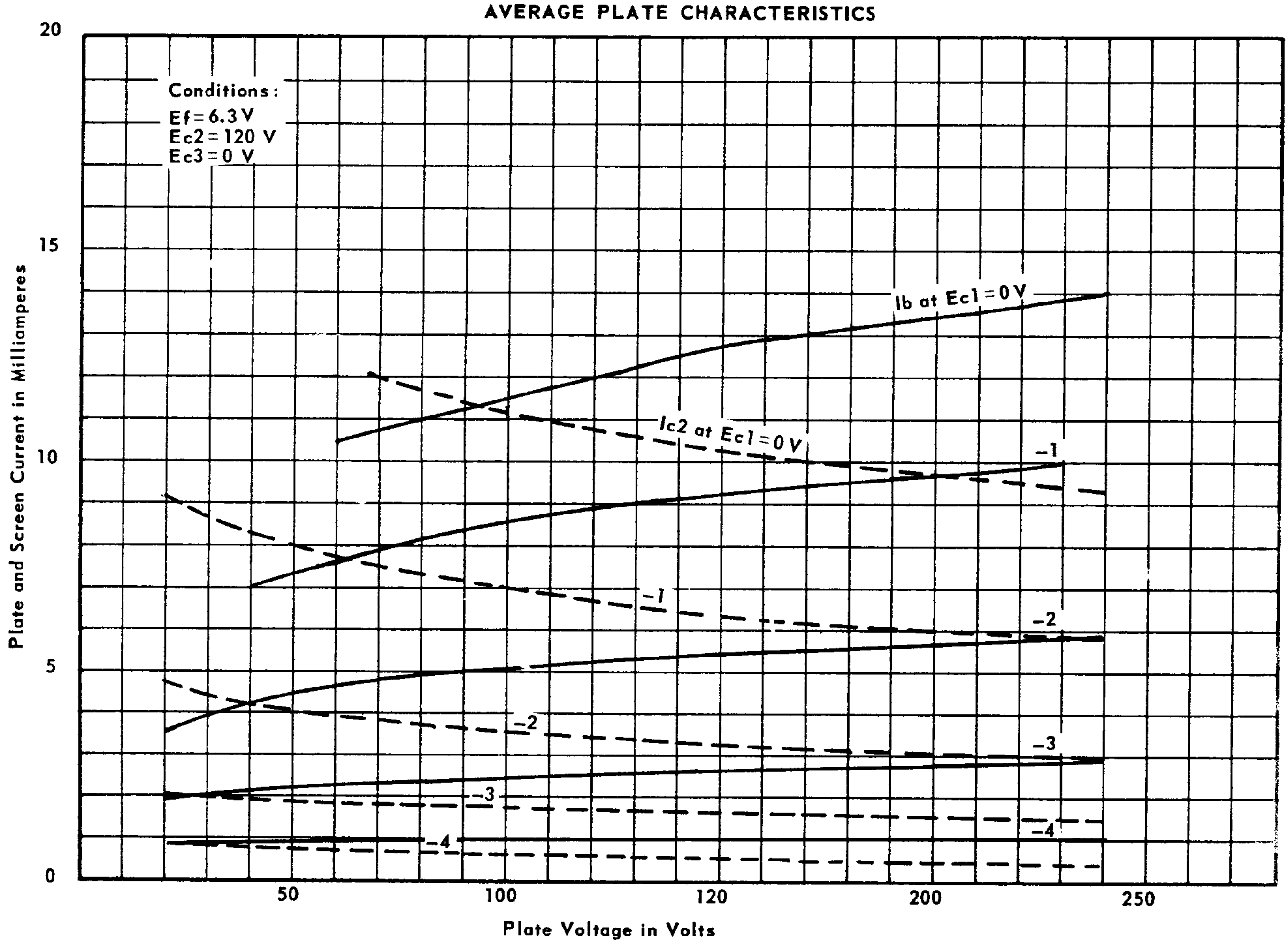
NOTES: (cont'd.)

Note 8 The output indicator shall be a VU meter. The three milliwatt point shall be determined as a meter deflection of 25% the calibration point.

Note 9 The output shall be read on a VU meter using a rejection limit of five (5) VU. Five (5) VU is the meter deflection obtained with a steady state output of 3 MW from the amplifier.

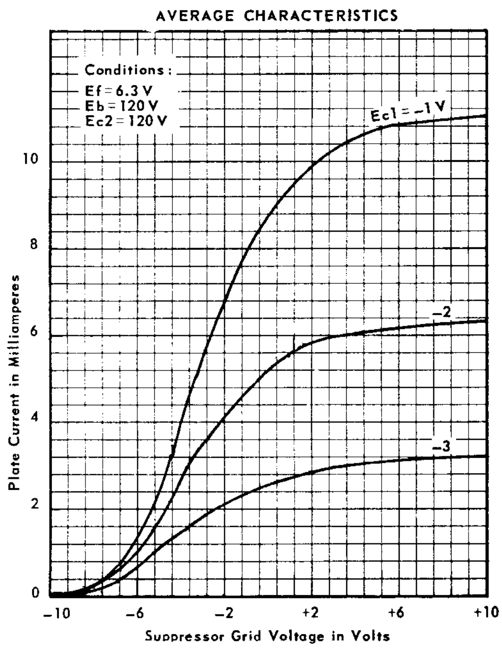
Note 10 The rejection limit shall be set at the VU meter reading obtained during calibration.

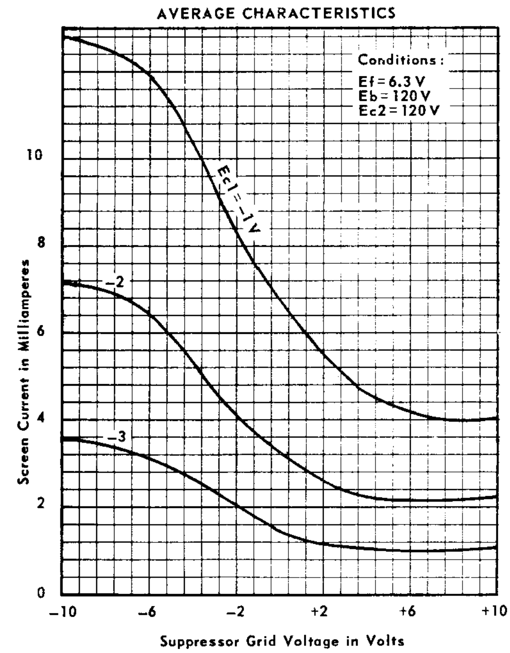
AVERAGE PLATE CHARACTERISTICS

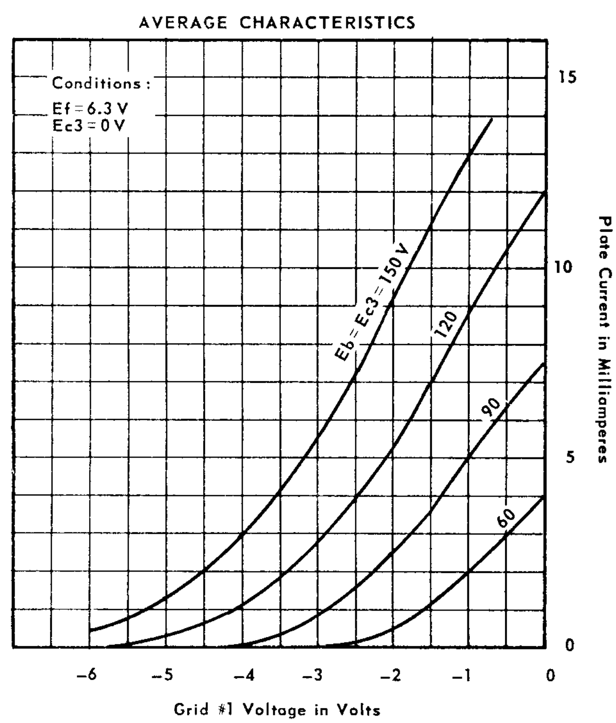


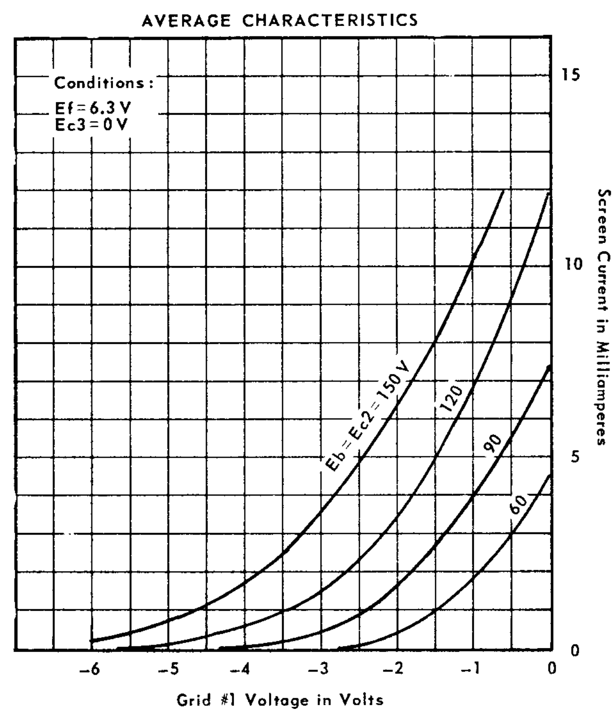
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MINIATURE PENTODE



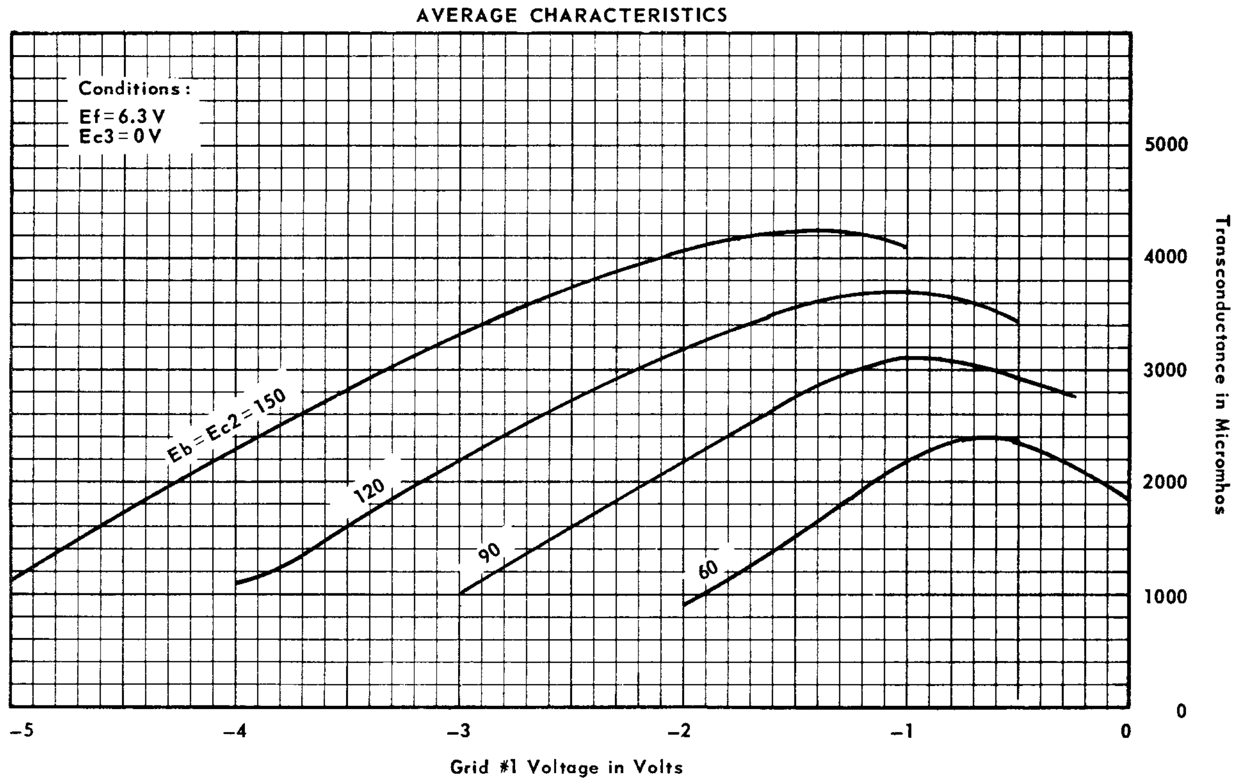


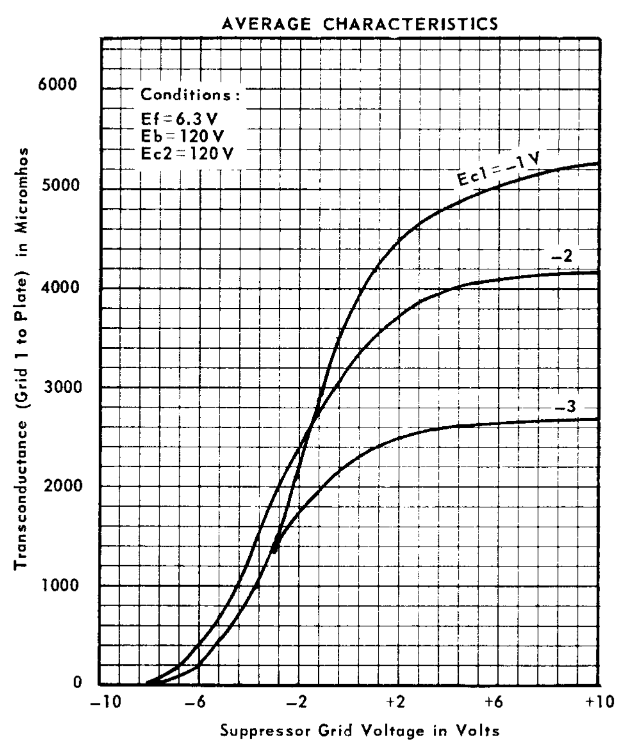




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MINIATURE PENTODE





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MINIATURE PENTODE

AVERAGE CHARACTERISTICS

